Apple Technical Procedures

Apple IIGS

Table of Contents

❏ CONNECTOR IDENTIFICATION

**Back
Panel**

The back panel of the Apple IIGS has eight ports, which
are listed below. The number beside the port name
below corresponds to the numbered arrow in Figure 1.

1) Apple DeskTop Bus
2) Composite Video
3) RGB Video
4) Disk I/O
5) Game I/O
6) Serial 1
7) Serial 2
8) Earphone

**Internal
Connectors**

There are seven connectors on the Apple IIGS logic
board. Some of these connectors can only be found on
an Apple Service exchange module or a retrofit board.
In the list below, the letter beside the connector name
corresponds to the lettered arrow in Figure 1.

A) Power Connector for the Apple IIe (retrofit
only)
B) Power Connector for the Apple IIGS system
C) Fan Connector (Additional Kit)
D) Numeric Keypad Connector for the Apple IIe
keypad (retrofit only)
E) Game I/O Connector
F) Keyboard Connector for the Apple IIe
(retrofit only)
G) Speaker Connector

❏ THEORY OF OPERATION OVERVIEW

Introduction

The Apple IIGS is made up of three basic modules: the logic board, the power supply, and the Apple DeskTop Bus Keyboard. This section will give you the necessary information to perform logical troubleshooting on the Apple IIGS. The information here includes a description of each module and the various functions it performs.

Apple IIGS Logic Board

The logic board is the heart of the system. The CPU is the 65C816, a 16-bit CMOS microprocessor which is compatible with the 6502 and 65C02.

The Apple IIGS logic board is divided into two subsystems: the Mega II IC provides support for existing Apple II software; the Fast Processor Interface IC (FPI) provides the new functions for the Apple II family.

Mega II IC

The Mega II is a custom IC. It performs the functions of the following IIe components:

- MMU Custom IC (Memory Management Unit)
- IOU Custom IC (Input/Output Unit)
- Character Generator ROMs (8 languages)
- TMG IC (Timing Management Generator)
- GLU IC (General Logic Unit)

In addition, it provides:

- Support of additional RAM
- Video logic

The Mega II IC is a full-function Apple II, providing the traditional support of slots as well as the support of the built-in ports.

Fast Processor Interface IC

The FPI provides the following:

- Support of additional RAM
- I/O "shadowing" (This allows I/O reads to be done at full system speed.)

❑ TOP COVER

Materials Required (None)

Remove

1. Disconnect the keyboard.

2. Place the machine with the front facing you.

3. Locate the tabs on the back of the machine (Figure 1, #1), one on each side. Push the tabs in with your index fingers and lift the top cover, back first, from the machine. No force is necessary. (Do not push down on the top of the machine with your thumbs.)

Replace

1. Position the top cover, front first. Align the bottom front edge with the plastic tabs on the front of the machine.

2. Lower the top cover until the rear tabs snap into position.

3. Connect the keyboard.
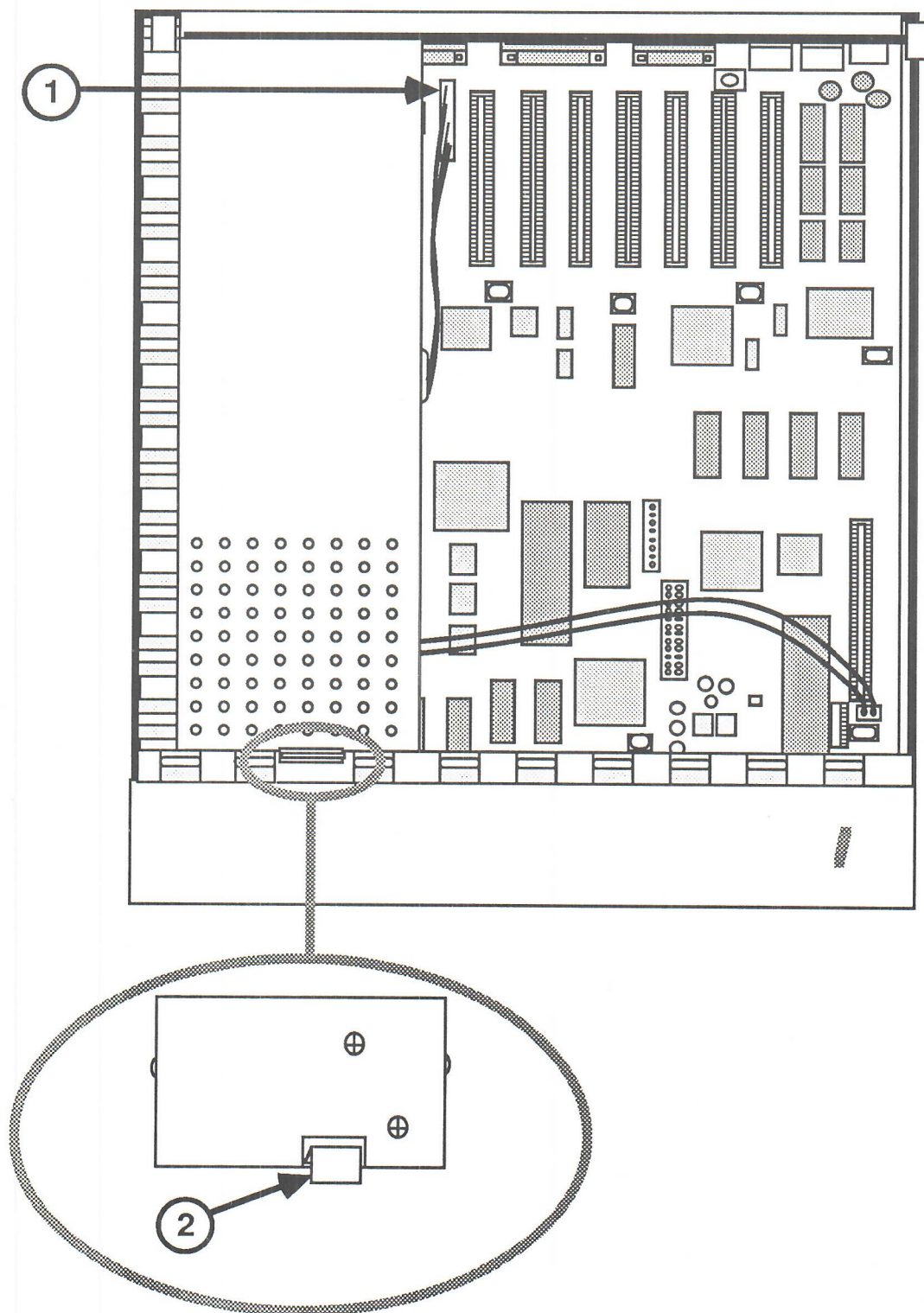
FIGURE 2

❏ POWER SUPPLY

Materials Required   (None)

Remove

1. Remove the top cover.

2. Locate and disconnect the power supply cable (see Figure 2, #1).

3. Locate the tab that holds the power supply in place (see Figure 2, #2).

4. Gently pull back the tab, lift the power supply up and slide it towards you off the tabs on the back of the case.

5. Lift the power supply from the case.

Replace

1. Position the power supply so that the three tabs on the back of the case slide into the power supply.

2. Lower the power supply into position so that the tab in the front clicks into place (see Figure 2, #2).

3. Reconnect the power supply cable (see Figure 2, #1).

4. Replace the top cover.
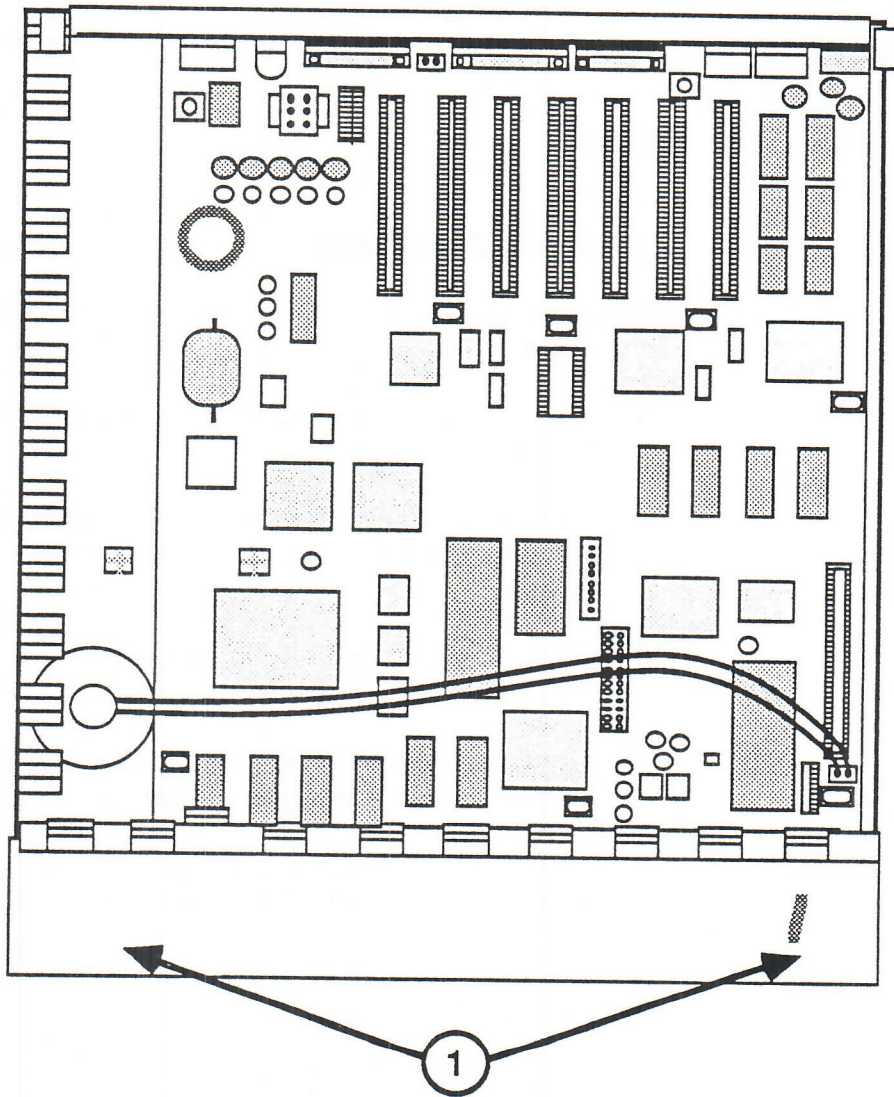
FIGURE 3
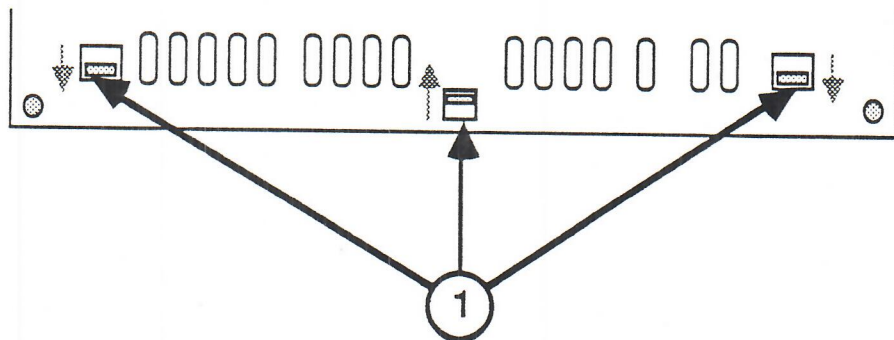
FIGURE 4

❏ THINGS TO REMEMBER

Backup
Information

1. Make a backup diskette before beginning! When testing a defective Apple IIGS it is possible to erase and/or damage a section of the diskette.

   The *System Utilities* diskette (Rev. 2.1.1 or higher) is used for making a backup copy. Follow the instructions in the *System Utilities Manual*.

Diagnostic
Information

2. If you are going to select the **Serial External Test**, the loopback cable must be installed.

3. To access the Help screen, hold down <Open-Apple> and <Shift> and press ?.

4. Before booting the diagnostic, enter the Control Panel (refer to Section 4, Troubleshooting). Verify that the keyboard type-ahead buffer is disabled. Verify that the language is set and the correct keyboard layout is selected for the keyboard that is connected. Verify that Slot 4 is set for the *Mouse Port* and that Slot 7 is set for *Your Card*. Then turn off the Apple IIGS, insert the *Apple II Diagnostic Diskette*, and reboot. If you do not use this method, the diagnostic may lock up or give false results.

5. When loading or saving selected test sequences to diskette, use only a known-good system and disk drive.

6. If you select the looping function and have selected a test which needs a loopback cable or card (Serial External Test, External Memory Card RAM Test) and the item is not installed, you will receive an error code.

Diagnostic
Commands

7. Where input is required to start the next test
   (after video tests, for example), press the
   <Spacebar>. If you press <Escape>, the testing will
   stop.

8. To abort the keyboard test, hold down <Control>
   and press C.

Choose
Tests

9. To make a selection, type the letter of the test or
   use the arrow keys until the selection is
   highlighted, and then press <Return>.

10. When chosen, the tests display a number (1, 2, 3,
    etc). This indicates the order in which the tests
    will be performed.

11. To deselect a test, type the letter of the test or use
    the arrow keys until the selection is highlighted;
    then press the <Delete> key. The numbers
    displayed will be corrected automatically. To
    deselect all tests, hold down <Open-Apple> and
    press <Delete>.

❏ APPLE II DIAGNOSTIC DISKETTE

Materials Required

Apple II Diagnostic Diskette
Loopback cable (optional)
Apple IIGS Memory Expansion Card (optional)
Known-good UniDisk 3.5 or 5.25
Apple IIGS or an Apple IIe which has the retrofit kit installed

**Main Menu
Selections**

The *Apple II Diagnostic Diskette* main menu is shown below.

```
 _____
|  Main Menu           |_____
|                               |
|  [a.]   Execute All Diagnostic Tests
|   b.    Execute Selected Tests
|   c. ▦  Choose Tests
|   d. ▦  Options
|   e. ▦  Special
|   f.    Quit
|                               |
|_____|
```
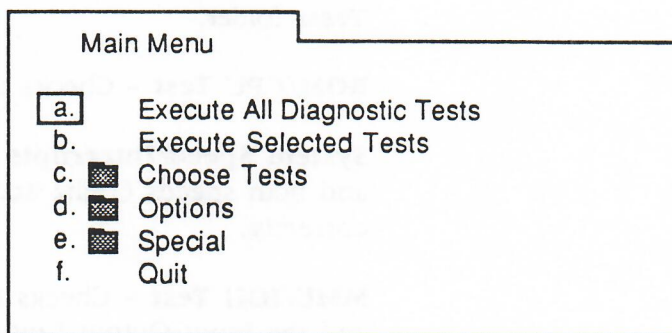
The following list describes each item in the main menu.

Execute All Diagnostic Tests – Runs the standard Apple IIGS test sequence.

Execute Selected Tests – Allows you to run only the tests selected in the **Choose Tests** folder.

Choose Tests – Contains all the tests that can be selected for the Apple IIGS.

Options – Contains various selections which allow you to control how the tests are run.

Special – Contains various options for keeping track of errors generated, for saving a test sequence, and for loading a test sequence from diskette.

Quit – Stops all testing reboots the system.

Choose Tests

The **Choose Tests** folder is shown below.

```
 Choose Tests
┌─────────────────────────────────────┐
│  a.    ROM/CPU Test                  │
│  b.    System Speed/ Interrupts Test │
│  c.    MMU/ IOU Test                 │
│  d.▓   RAM Tests                     │
│  e.▓   Serial Port Test              │
│  f.▓   Disk Port Tests               │
│  g.▓   Sound Circuitry Tests         │
│  h.▓   Video Pattern Tests           │
│  i.▓   Keyboard/ Mouse Tests         │
└─────────────────────────────────────┘
```
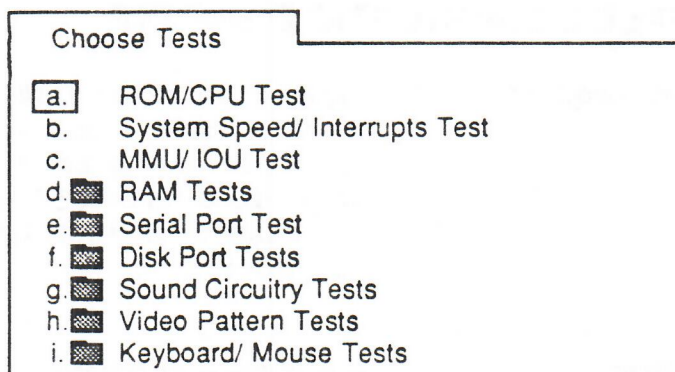
The following list describes the items in the **Choose Tests** folder.

ROM/CPU Test – Checks the ROM and CPU.

System Speed/Interrupts – Checks that the interrupts and both speeds (1Mhz and 2.8 MHz) are functioning correctly.

MMU/IOU Test – Checks the Memory Management Unit and the Input/Output Unit.

RAM Tests Folder

RAM Tests – This folder contains the following:

- Main Logic Board RAM Test – Checks the 256K on the logic board.

- External Memory Card RAM Test – Checks the RAM on an Apple IIGS Memory Expansion Card (if installed). This test will not run unless selected. Refer to Section 5, Additional Procedures, for more information.

- Clock RAM Test – Checks the RAM that is used for the clock and the clock time keeping function.

Serial Ports Folder

Serial Ports – This folder contains the following:

- Serial Internal Test – Checks the logic board circuitry that handles the serial ports.

- Serial External Test (Loopback is required) – Checks the ports to be sure they are sending and receiving data correctly.

Disk Port Folder

Disk Port – This folder contains the following:

- Disk Port Test – Checks the drive circuitry on the logic board for all 3.5- or 5.25-inch drives that are attached to the system. The diskette in the drive must be formatted with ProDOS in order to be tested.

Sound Tests Folder

Sound Tests – This folder contains the following:

- Sound Circuitry Test – Checks the specialized sound components and the sound RAM on the logic board.

- Speaker Tone Test – Checks the speaker by playing a sequence of beeps.

Video Pattern Tests Folder

Video Pattern Tests – This folder contains the following:

- Color Bar Test – Displays vertical color bars with the name of each color below.

- Character Generator Test – Displays the Swedish, German, Italian, Spanish, Danish, French, British, Domestic, and Domestic2 character sets.

- 80/40 Column Text Test – Displays a few lines of 80 and 40 column characters.

- Low Resolution Graphics Test – Displays both pages (one and two) of the low resolution graphics mode with bars at the top of the screen.

- <u>High Resolution Graphics Test</u> – Displays both pages (one and two) of a grid of 9 vertical lines intersected by 8 horizontal lines.

- <u>Double High Resolution Graphics Test</u> – Displays a grid of 18 vertical lines intersected by 8 horizontal lines.

- <u>Super High Resolution Graphics Test</u> – The first screen displays a grid of 11 vertical lines intersected by 21 horizontal lines, the second screen displays 6 vertical color bars, and the third screen displays a solid blue screen.

- <u>Border Color Test</u> – Displays the 16 possible border colors.

Keyboard and Mouse Tests Folder

Keyboard/Mouse Tests – This folder contains the following:

- <u>ADB Domestic Keyboard</u> – Displays a keyboard layout for the Apple Desktop Bus Keyboard which is used on the Apple IIGS. The instructions are given at the bottom of the screen.

- <u>Standard IIe Keyboard Test</u> – Displays a keyboard layout for the standard Apple IIe keyboard. The instructions are given at the bottom of the screen.

- <u>Extended IIe Keyboard Test</u> – Displays a keyboard layout for the Apple IIe Extended Keyboard (with built-in keypad). The instructions are given at the bottom of the screen.

- <u>Languages</u> – Displays a list of languages available for the keyboard tests. The default setting is U.S.A. English. The language selected here must match the one in the Control Panel setting.

- <u>ADB Mouse Test</u> – Displays a pointer which can be moved around the screen and which indicates whether the mouse button is pressed or not.

- <u>Joystick/Paddle Test</u> – Displays a pointer which can be moved around the screen and which indicates whether the joystick/paddle buttons are pressed or not. If you are testing paddles, verify that both reach the full range possible (0-FF).

Options

When the **Options** folder is open, the following list of selections appears on the screen.

- <u>Loop Tests Until Esc is Pressed</u>
- <u>Continue On Error Until Esc</u>

If an option is selected, a check mark appears beside the item. To deselect an option, just select the same option again.

Special

The following selections appear when the **Special** folder is opened.

- <u>Display Error Log</u> – Displays the names of the tests that failed since the last clearing of the error log (up to 255 names).

- <u>Clear Error Log</u> – Erases the log from RAM.

- <u>Clear Testing Status Line</u> – Clears the iterations and failure counts displayed.

- <u>Display Current System Status</u> – This indicates the type of system, the ROM version, the amount of memory available (number of banks), and the memory card status.

- <u>Load Selected Test Sequence from Disk</u> – This will load a previously saved test sequence. The sequence can then be executed.

- <u>Save Selected Test Sequence to Disk</u> – This will save a test sequence you have selected to the test diskette.

When any of the above items is selected and <<u>Return</u>> is pressed, the action is performed.

Running the Diagnostics

The diagnostic program can be configured in various ways. All the tests can be run in their automatic sequence, or selected tests can be looped or run in an order you specify.

The diagnostic also has the ability to execute a test selection sequence that has been saved to the test diskette. Saved test sequences make it easier to test Apple IIGS Upgrade systems and other specially configured systems that require non-standard tests (see "Customized Tests").

> *Note:* Before booting the diagnostic, enter the Control Panel (refer to Section 4, Troubleshooting). Verify that the keyboard type-ahead buffer is disabled. Verify that the language is set and the correct keyboard layout is selected for the keyboard that is connected. Verify that Slot 4 is set for the *Mouse Port* and that Slot 7 is set for *Your Card*. Then turn off the Apple IIGS and reboot it with the diagnostic; otherwise the diagnostic may lock up or give false results.

Standard Test

1. Install the appropriate loopback connector and the memory card, if available.

   If they are not available, type N when the diagnostic asks you if they are installed. The testing will continue.

2. Insert the *Apple II Diagnostic Diskette* and power on the system.

3. Type the letter a or use the arrows to select **Execute All Diagnostic Tests**, and press <Return>.

   To continue after certain tests (for instance, speaker, video patterns), press the <Spacebar>.

   If an error is encountered, the testing will stop and an alert box will appear specifying which test failed. Refer to "Test Failures" at the end of this section for the appropriate actions to perform.

4. On completion, the message **Testing finished** will be displayed in the alert box.

Customized
Test

1. If you are going to test the Serial ports and the Memory card, install these items now.

2. Insert the *Apple II Diagnostic Diskette* and power on the system.

3. Type the letter c or use the arrows to select **Choose Tests**, and press <Return>.

4. From this menu, select the first three tests (if desired) and press <Return> to select them.

   Select the other test folders and press <Return> to display them. Select the tests you wish to run from each folder and press <Return> to select them.

   If you wish to deselect a test, use the letters or arrows to select the test and press the <Delete> key.

Saving and Loading
Test Sequences

5. To save your customized test sequence, return to the main menu, and select **Special**. Select **Save Selected Test Sequence to Disk** and press <Return>.

   You now have the selected test sequence saved to diskette. The sequence may be loaded using **Load Selected Test Sequence From Disk** at a later date when it is needed.

6. On completion, return to the main menu, select **Execute Selected Tests,** and press <Return>.

   To continue after certain tests (for instance, speaker, video patterns), press the spacebar.

   If an error is encountered, the testing will stop and an alert box will appear specifying which test failed.

7. On completion, the message **Testing Finished** will be displayed in the alert box.

Continuous Test

A continuous (looping) test is possible with all tests. Select the tests you wish to loop by following the instructions under "Customized Test" (see above). Follow the steps below to run a continuous test.

1. After you have chosen the tests you want to run, return to the main menu, select **Options**, and press <u>Return</u>.

2. From the menu select **Loop Tests Until Esc is Pressed** and press <u>Return</u>.

   A check mark should appear, indicating that it has been selected.

3. Select **Continue On Error Until Esc** if you want to continue looping regardless of the error until <u>Escape</u> is pressed.

   If you do not select this option, the testing will halt when an error is encountered.

   Errors will be logged to RAM.

4. Return to the main menu, select **Execute Selected Tests**, and press <u>Return</u>.

   The tests will run (depending on your selection in step 3) continuously until an error occurs or <u>Escape</u> is pressed. If <u>Escape</u> is pressed, the looping is canceled.

   If you press <u>Escape</u> to stop the testing, you can then check for errors by selecting **Special** and pressing <u>Return</u>, then select **Display Error Log**.

5. If you are going to run the test again, be sure to clear the error log and the status line to reselect **Loop Tests Until Esc is Pressed** before returning to the main menu.

**Test
Failures**

When a test fails, the following type of message will be displayed:

```
Report the following information on the repair form:

ROM/CPU Test Failed

Refer to the Apple Service Technical Procedures
```

The following is a list of the tests along with the recommended remedial actions.

Tests	Remedial Action
• *ROM/CPU*	– Exchange logic board.
• *System Speed/ Interrupts*	– Exchange logic board.
• *MMU/IOU*	– Exchange logic board.
• *Main Logic Board RAM*	– Exchange logic board.
• *Memory Expansion Card*	– Refer to Section 5, Additional Procedures.
• *Clock RAM*	– Exchange logic board.
• *Serial Internal*	– Exchange logic board.
• *Serial External*	1. Exchange loopback cable. 2. Exchange logic board.

Tests	Remedial Action
• *Disk Port*	1. Exchange drive. 2. Exchange logic board.
• *Sound Circuitry*	1. Exchange logic board. 2. Exchange speaker.
• *Speaker*	1. Exchange speaker. 2. Exchange logic board.
• *All Video*	1. Exchange logic board.
• *ADB Domestic Keyboard*	1. Exchange cable. 2. Exchange keyboard. 3. Exchange logicboard.
• *Standard IIe Keyboard*	1. Exchange cable. 2. Exchange keyboard. 3. Exchange logic board.
• *Extended IIe Keyboard*	1. Exchange cable. 2. Exchange keyboard. 3. Exchange logic board.
• *ADB Mouse*	1. Exchange mouse. 2. Exchange cable for keyboard. 3. Exchange keyboard. 4. Exchange logic board.
• *Joystick/Paddle*	1. Exchange joystick/paddle. 2. Exchange logic board.

 Apple Technical Procedures

Apple IIGS

Section 4 – Troubleshooting

❑ CONTENTS

❏ INTRODUCTION

**General
Information**

This troubleshooting section can be used if the diagnostics are unable to detect a module failure or if the diagnostic diskette cannot be booted. After repairing the system, the diagnostic should be run to verify system operation.

**Before
You
Start**

Read the section entitled "Things to Remember" before you begin troubleshooting. There are numerous things you need to know about the Apple IIGS in order to troubleshoot the system effectively.

**How to Use
the Symptom
Chart**

The symptom chart has two columns. The left hand column lists the problem of the defective system, the right hand column lists corrective actions. For each symptom, perform the corrective action(s) in the order listed. If a corrective action does not fix the problem, proceed to the next step.

If a board is replaced but does not fix the problem, the original board should be reinstalled before you perform the next step.

❏ APPLE IIGS SYMPTOM CHART

Video Problems

- *Display is fuzzy on a known-good monitor*
  1. Verify Control Panel setting for video.
  2. Verify that the software supports the monitor (RGB, etc.).
  3. Exchange logic board.

- *Garbage displayed on known-good monitor; no beep*
  1. Exchange logic board.
  2. Exchange power supply.

- *No video, no beep; power light on*
  1. Exchange logic board.
  2. Exchange power supply.

- *Cosmetically flawed video display*
  1. Verify VGC revision; if necessary upgrade the VGC (refer to Section 5, Additional Procedures).
  2. Exchange power supply.

Drive Problems

- *Won't boot from known-good disk drive*
  1. Verify Control Panel setting for correct slot assignment.
  2. Exchange software.
  3. Exchange logic board.

- *Known-good drive does not turn on*
  1. Verify Control Panel setting for correct slot assignment.
  2. Exchange logic board.

Peripheral Problems

- *No keyboard output or wrong output is displayed*
  1. Verify Control Panel setting for correct language selection.
  2. Exchange Apple DeskTop Bus cable.
  3. Exchange keyboard.
  4. Exchange logic board.

- *No output from specific keyswitch(es)*
  1. Exchange keyboard or keyswitches.
  2. Exchange logic board.

- *No audio*
  1. Verify Control Panel setting for sound.
  2. Exchange logic board.
  3. Exchange speaker.

- *Problems transmitting and receiving data with a known-good modem*
  1. If a port is being used, verify that modem DIP switch settings match the settings in the Control Panel.

     OR

     If a slot is being used, verify that modem DIP switch settings match the settings on the interface card and that the correct slot is selected in the Control Panel.
  2. Exchange logic board.

- *Won't print to a known-good printer*
  1. If a port is being used, verify that printer DIP switch settings match the settings in the Control Panel.

     OR

     If a slot is being used, verify that printer DIP switch settings match the settings on the interface card and that the correct slot is selected in the Control Panel.
  2. Exchange logic board.

- *Cannot read or write to ProFile*
  – Add a jumper to the interface card (refer to Section 5, Additional Procedures).

- *Unidentifiable system crashes when accessing the Hard Disk 20SC*
  – Check the ROM version on the interface card (refer to Hard Disk 20SC, Appendix A).

Miscellaneous Problems

- *No power light, no video*

  1. Exchange AC power cord.
  2. Exchange power supply.
  3. Exchange logic board.

- *Programs run erratically and often crash*

  1. Verify Control Panel setting for speed (normal or fast). Different software will require different settings.
  2. Exchange logic board.

Apple Technical Procedures

Apple IIGS

Section 5 – Additional Procedures

❏ CONTENTS

❏ BATTERY REPLACEMENT

Introduction

Lithium thionyl chloride batteries, the type used in the Apple IIGS, have a potential for explosion if improperly handled. The following precautions should be taken when storing, handling, and disposing of lithium batteries.

- Lithium batteries should be stored in a designated, well-marked area with limited access.

- Apple's lithium batteries are sealed in individual zip-lock wrappers. Upon receipt, the batteries should be inspected for integrity of their wrappers and should be stored in the same packaging in which they were received.

- Lithium batteries cannot be recharged and therefore will require disposal when "dead." In addition to its explosive potential, lithium is water-reactive, **and must be disposed of as a hazardous waste.** Therefore, Apple recommends the following course of action:

Battery Disposal

After removing a "dead" battery from a board, clip off the lead wires and place the battery into the zip-lock wrapper and original packaging from which the replacement battery was taken. Mark the battery *DEAD* and return it to Apple, where it will be disposed of following EPA guidelines.

The Apple IIGS contains a single long-life lithium battery that should serve for the life of the product in most cases. However, if a battery should fail, replace it according to the following procedure.

Materials Required

Soldering iron (60 watt, 700 degrees)
Solder sucker
60/40 resin core solder
Small wire cutters

Remove

1. Remove the Apple IIGS logic board from the case. Refer to Section 2, Take-Apart, if necessary.

2. Locate the battery on the front of the logic board (see Figure 1, #1). Turn the logic board over. The battery is held in place by two soldered leads. Apply fresh solder to the two connections.

3. Desolder the two connections.

WARNING: *Do not force the connections free. Force can remove the traces on the board. Repeat step 3.*

---

4. Remove the battery and return it to Apple.

Replace

1. Insert the new battery so that it is flush with the board. Be sure the positive side of the battery is in the correct location (see Figure 1, #1).

2. Solder the battery into place and then clip the excess ends from the back of the board. A length of about 1/16 inch is sufficient.

3. Replace the logic board. Refer to Section 2, Take-Apart, if necessary.

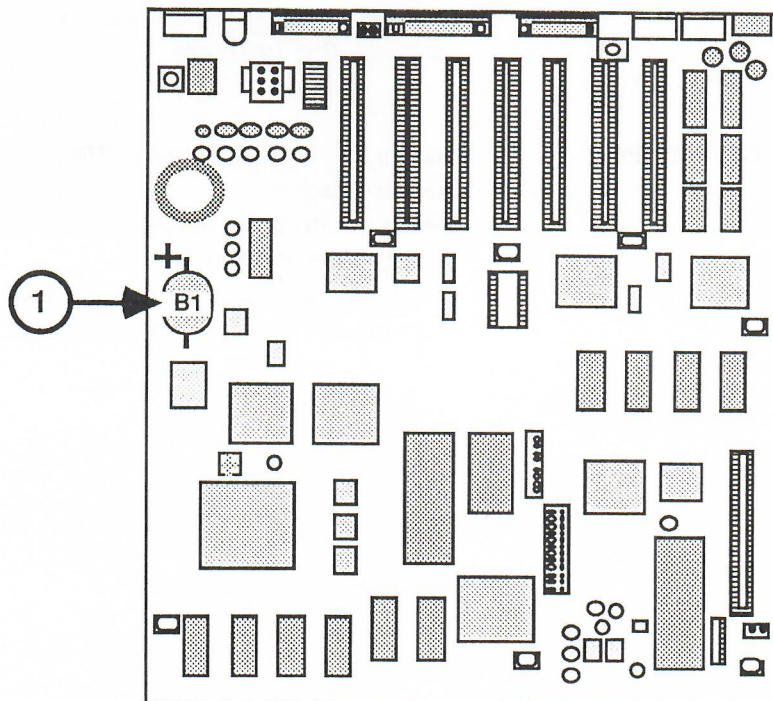4. Set the clock by using the Control Panel.

FIGURE 1

❏ APPLE IIGS FAN KIT

The optional Apple IIGS fan works with the vents on the top and bottom of the case to circulate fresh air through the inside of the case. This keeps the system running cooler and prolongs its life. The user installs the fan with the instructions provided in the *Apple IIGS Fan Kit Owner's Guide.*

The fan is mounted on the power supply by plastic hooks which snap into place. The connector from the fan is then plugged into two prongs marked "fan" on the logic board (located between the RGB monitor port and the disk drive port).

❏ PROFILE INTERFACE CARD MODIFICATION

Some ProFile interface cards cause incompatibility problems when used with the Apple IIGS. Adding a jumper wire, as described in the following procedure, corrects the problem.

Materials Required

Soldering iron (60 watt, 700 degrees)
Solder sucker
60/40 resin core solder
Small wire cutters
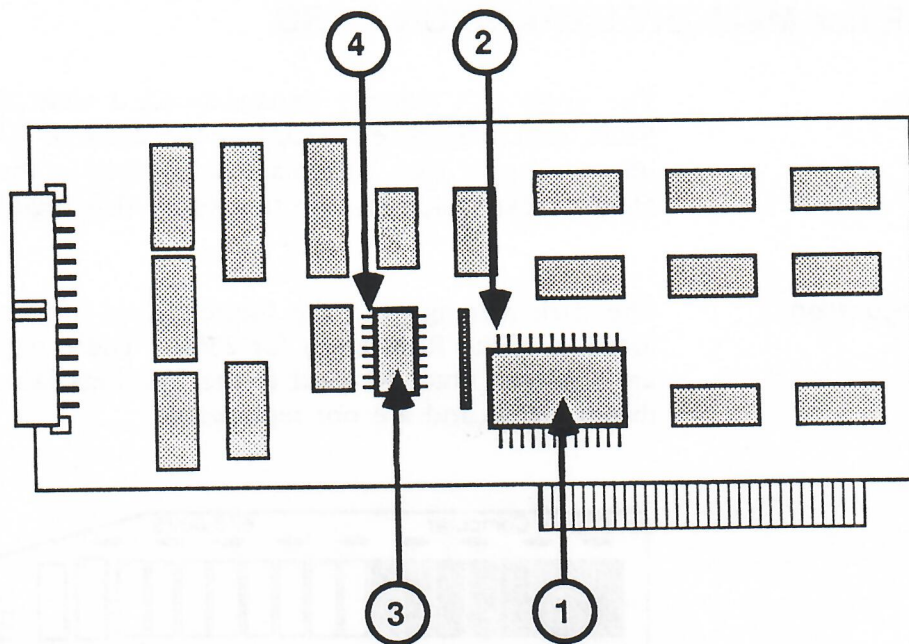Piece of insulated wire with both ends stripped of
about 1/4 inch of insulation

FIGURE 2

Procedure

1. On the IC at C6 (Figure 2, #1) locate pin 12 (Figure 2, #2).

2. On the IC at B4 (Figure 2, #3) locate pin 1 (Figure 2, #4).

3. Turn the board over and verify the locations on the back of the board.

   Note: If a jumper is already installed between these pins, exchange the interface card.

4. Solder one end of the wire to pin 1 on the IC at B4.

5. Solder the other end of the wire to pin 12 on the IC at C6.

6. Install the interface card in the Apple IIGS, and verify that the Control Panel is set correctly. Try to read and write to the ProFile. If the original problem persists, refer to the *ProFile Technical Procedures* for troubleshooting information.

❏ APPLE IIGS MEMORY EXPANSION CARD

Introduction

The Apple IIGS Memory Expansion Card adds 256K, 512K, or 1 megabyte of RAM to the 256K of RAM built into the Apple IIGS. The card is installed in the Memory Expansion slot on the Apple IIGS logic board.
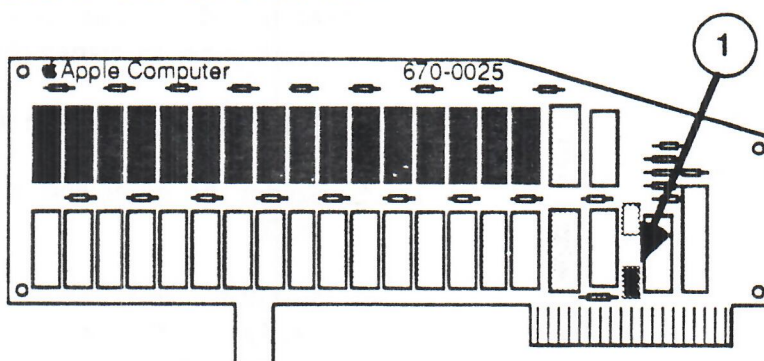
256K Configuration

The dark rectangles in the figure below indicate the location of the RAM chips for 256K. These eight chips are soldered onto the card at the locations labeled UA1 through UA8 and are not replaceable.
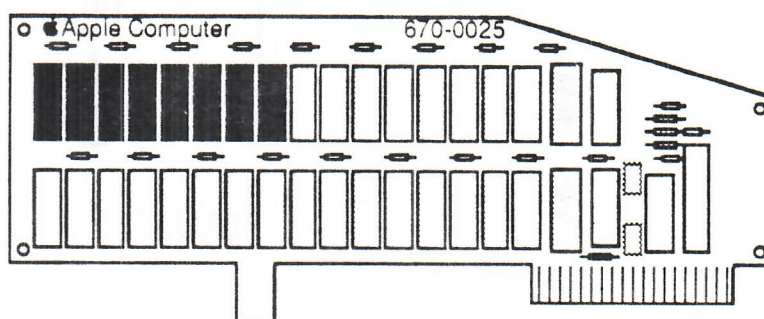

512K Configuration

The dark rectangles in the figure below indicate the location of the RAM chips for 512K. (The 256K RAM locations described above are included.) The eight additional chips (256K) must be installed in the sockets at locations UA9 through UA16 on the card. The jumper (J2) indicated as #1 below must be installed for the card to "see" the 512K RAM.

1 Megabyte
Configuration

The dark rectangles in the figure below indicate the location of the RAM chips for 1 megabyte. (The 512K RAM locations described above are included.) The 16 additional chips (512K) must be installed at the locations labeled UB1 through UB16 on the card. The additional jumper (J1) indicated as #2 below must be installed for the card to see the full 1 megabyte.
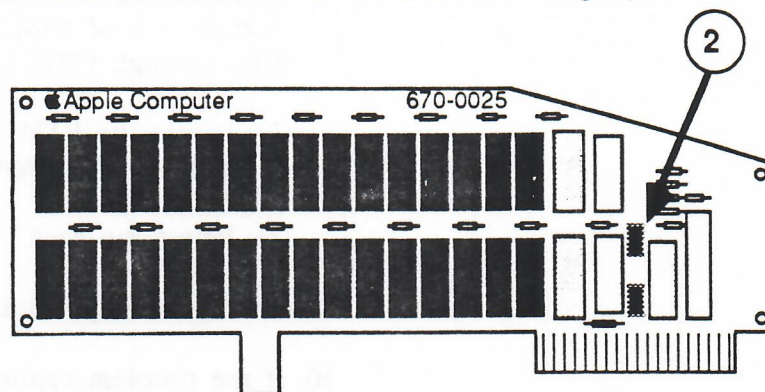
Troubleshooting

The Apple IIGS Memory Expansion Card exchange module is shipped **without** socketed RAM. All socketed RAM must be removed from the card before returning it to Apple.

Note: Some Apple IIGS Memory Expansion Cards have all the RAM soldered to the card. To exchange this type of card, you will need to fill out two SRO forms, one for the Memory Expansion Card and one for the additional 24 RAM chips.

Materials Required

Known-good Apple IIGS and 3.5-inch (or 5.25-inch) Disk
    Drive
Known-good RAM chips
Apple IIGS Memory Expansion Card
Apple II Diagnostic Diskette

Testing the RAM

1. Install the Apple IIGS Memory Card into the memory slot.

2. Start up the *Apple II Diagnostic Diskette.* Select the **Apple IIGS Memory Expansion Card Test** and run the test.

3. Two types of failures are possible on the Apple IIGS Memory Expansion Card:

a) If a RAM chip fails, a numbered location on the board will be indicated on the screen.

Note: The top row of RAM on the card has the markings UA1 through UA16 above the sockets (UA1 through UA8 are not replaceable). The bottom row of RAM on the card has the markings UB1 through UB16 below the sockets.

1) Locate the RAM and replace it with a known-good RAM chip.

2) Retest the card.

3) Repeat steps 1) and 2) until the card passes.

b) If the problem cannot be corrected by replacing a RAM chip, the screen will tell you to exchange the entire card.

1) Remove all the RAM from the customer's card.

2) Test the module being used for exchange.

3) Install the customer's RAM onto the new module.

4) Run the Apple IIGS Memory Expansion Card Test.

5) Return to the beginning of this step until the card passes.

❏ APPLE IIGS UPGRADE FOR THE APPLE IIe

Introduction

The Apple IIGS Upgrade Kit gives IIe owners a direct upgrade path to the Apple IIGS and all of its features. The kit includes the Apple IIGS logic board, a new bottom pan, and various bags of hardware. For more information on the Apple IIGS and its features, refer to the manual *From Apple IIe to Apple IIGS: Performance Update* or Section 1, Basics.

Things To Remember

1. Follow the electrostatic discharge precautions listed on the next page.

2. The kit contains a product label on the underside of the bottom pan that bears the UL and CSA marks. These marks are valid only if the Apple IIe that is being retrofitted is UL and CSA approved.

   If the Apple IIe bottom pan does not carry the UL and CSA approvals, you must modify the product label on the retrofit bottom pan. Use an indelible black felt marker and block out the appropriate marking(s).

3. Before returning the system to the customer, run the *Apple 5.25 Innch Disk Drive Diagnostic* to verify that the system is functioning correctly. Refer to Section 3, Diagnostics.

4. If the customer's Apple IIe has a keyboard with a built-in keypad (Apple IIe Extended Keyboard) the keyboard must be modified in order to work correctly with the Apple IIGS. (The instructions are included in these procedures.)

5. Old Apple IIe cases made from structural foam will not fit correctly on the retrofit. To identify a structural foam case, remove the cover and look toward the back of the unit. If there are two oval plastic velcro pads, it is a foam case. Replace this case with the Apple IIe Case and Lid available from Apple.

6. Follow the return information included in the kit to ensure proper credit.

**Electrostatic
Discharge
Prevention**

Electrostatic Discharge (ESD) can cause severe damage to sensitive microcircuits. Just touching a chip or brushing it with a nylon sleeve can degrade a circuit so that it never performs again to specifications. Some microcircuits are sensitive to as little as 500 volts, or about one-sixth as much static electricity as you can feel.

Certain preventive measures must be taken to avoid ESD damage to the new logic board. When you are wrapping, installing, or replacing the logic board or any other microcircuit, observe the following precautions:

1. **Before handling boards or ROMs, ground yourself!** Wear a grounding wriststrap and attach it to your workbench pad. The pad must then be grounded to a workbench that is grounded to the building's ground.

2. **Ground the Apple IIe chassis to the same potential you hold.** Place the Apple IIe on the grounded workbench pad. Be sure the chassis is in contact with the workbench pad at all times OR connect the chassis to the workbench pad via alligator clips.

3. **Use antistatic bags for carrying boards and ROMs.** Whenever the ROMs or board are to be stored or moved anywhere, first put them in an antistatic bag. Be sure to touch the bags before touching the ROMs.

4. **Handle ROMs by the body, not the leads.** You may safely touch the leads only if you are grounded.

5. **Do not wear polyester clothing or bring plastic, vinyl, or styrofoam into the area.** The static field around these items cannot be removed.

6. **Do not place board or ROMs on any metal surface.** Place them on the grounded workbench pad or on antistatic or nonconductive foam.

Materials Required

The following hardware is included in the kit:

>   Bottom pan
>   Apple IIGS logic board
>   Keyboard support brackets
>   Apple IIe shielding strip

The following will be in plastic bags labeled with the corresponding part numbers. The hardware shown below with an asterisk (*) may not be needed to perform the upgrade. This will depend on the version of the Apple IIe system being upgraded.

>   Nameplates (2) (607-5182)
>   Power supply screws (4) (607-5176)*
>   Bottom pan screws (9) (607-5177)*
>   Logic board mounting screws (2) (607-5178)
>   Keyboard and bracket mounting screws (8)
>   (607-5179)*
>   U-Nuts (9) (607-5180)*
>   PCB Supports (9) (607-5181)

>   *Note:* The bag of screws labeled 607-5193 is for Canadian upgrades only.

The following tools are needed:

>   ESD equipment
>   Phillips head screwdriver
>   Flathead screwdriver
>   Small flathead screwdriver
>   Small needlenose pliers

Installation Instructions

Before you begin, be sure to read the instructions on ESD prevention and all the information under "Things to Remember."

Keyboard Information

If the keyboard is mounted on the Apple IIe case, do not remove it. If the keyboard is mounted on brackets and not connected to the case, remove the keyboard.

If the customer has an Apple IIe Extended Keyboard, you will have to make a modification to the keyboard. Turn to "Apple IIe Extended Keyboard Modification" and perform the procedure now.
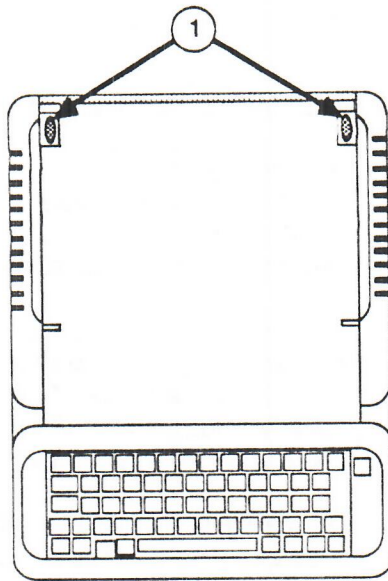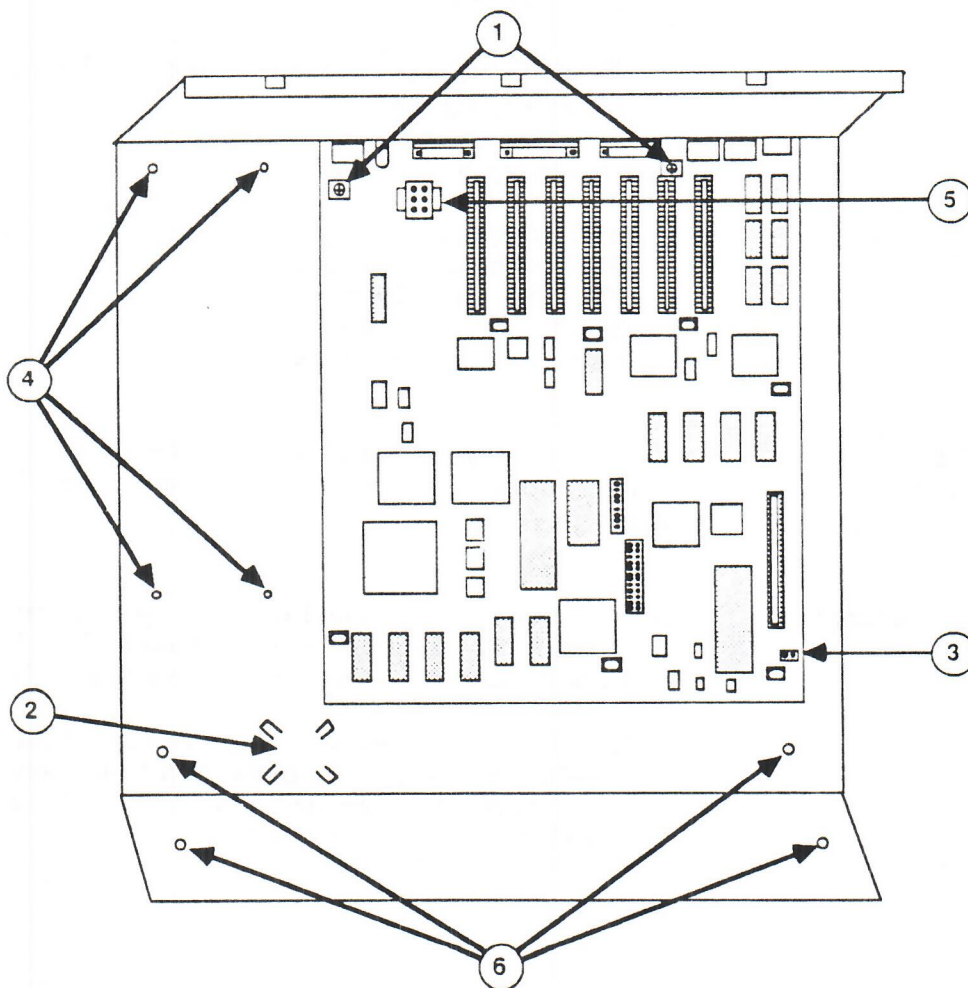
FIGURE 3

FIGURE 4

Case Information

Old Apple IIe cases made from structural foam will not fit correctly on the retrofit. To identify a structural foam case, remove the lid and look toward the back of the unit. If there are two oval plastic velcro pads (see Figure 3, #1), it is a foam case. Discard the case and replace it with a plastic case. The plastic case is available from Apple under the name "Apple IIe Case and Lid, Beige."

1. Remove the following from the customer's Apple IIe (if necessary, refer to *Apple IIe Technical Procedures*, Section 1, Take-Apart).

   Top cover and housing
   Power supply
   Speaker
   Keyboard

2. Install the nine PCB supports into the nine square holes on the new bottom pan.

3. Install the Apple IIGS logic board onto the PCB supports on the new bottom pan. Install the two logic board mounting screws (Figure 4, #1).

4. Install the customer's speaker on the new chassis (Figure 4, #2).

5. Connect the speaker cable to its plug on the logic board (Figure 4, #3).

6. Align the screw mounts on the customer's power supply with the screw holes on the new bottom pan (Figure 4, #4). Insert and tighten the four power supply screws.

7. Connect the power supply connector to its socket on the logic board (Figure 4, #5).

8. Install the customer's keyboard.

   If the keyboard is mounted on the case, skip to step 11.

   If the keyboard is mounted on brackets, continue to step 9.

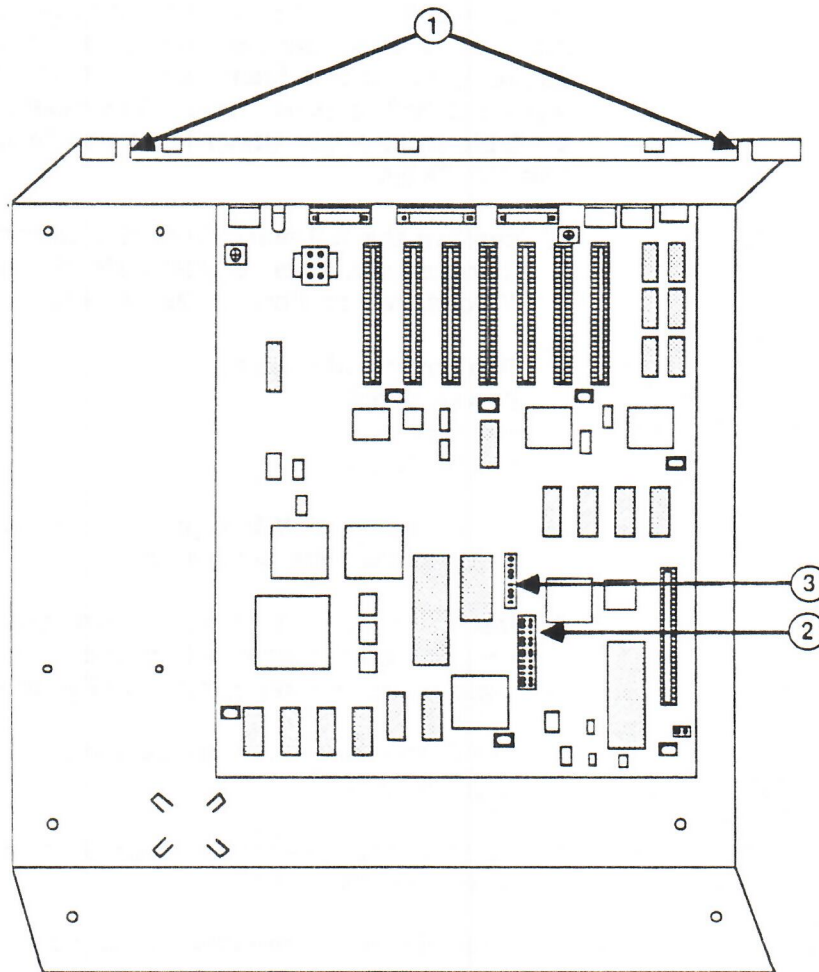9. Using four of the screws, install the brackets (one on each side) on the bottom pan (Figure 4, #6).
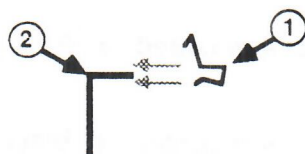
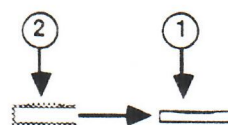**FIGURE 5**

FIGURE 6

FIGURE 7

10. Position the keyboard on the brackets and insert the four remaining screws.

    You may need to adjust the position of the keyboard when installing the case to ensure an even gap between the keyboard and case.

11. Install the shielding strip on the rear of the bottom pan between the two notches (Figure 5, #1). Figure 6 shows a side view of the shielding strip (Figure 6, #1) being slid onto the rear lip of the bottom pan (Figure 6, #2).

12. Check the plastic case to ensure that it has u-nuts installed on all the screw holes. If they are not installed, refer to Figure 7, which is a side view of one hole (Figure 7, #1) with the u-nut being slipped into position (Figure 7, #2).

13. Remove the two old nameplates on the lid by inserting a small flatblade screwdriver into the hole in the lid underneath the nameplates. Install the new ones, and destroy the old ones.

14. Position the customer's case on the new chassis.

15. Connect the keyboard cable to its socket on the logic board (see Figure 5, #2).

16. Insert and tighten the screws to hold the case in place.

    Note: If the customer has an Apple IIe Numeric Keypad, plug it into the connector shown in Figure 5, #3.

17. Run the functional test on the system to verify that it is working correctly. (Refer to Section 3, Diagnostics.)

18. Return the appropriate items to Apple. Follow the instructions included in the kit.

**Apple IIe
Extended Keyboard
Modification**

There are two keyboards available that have built-in keypads. In order for either of the keyboards to work correctly with the Apple IIGS logic board, two jumper pads may need to be cut (or unsoldered depending on the style of the jumper pads) and two jumper pads need to be soldered.

Keyboard Identification

The solder pads are located in different areas on the two keyboards. Identify the keyboards as Mitsumi or TCI. The Mitsumi keyboard has the name Mitsumi in the lower left corner on the back of the keyboard.

Solder Pads

Identify the type of solder pads used on the keyboard. There are two types of solder pads used. Some keyboards use the solder pad that needs to be cut and soldered (Figure 8-A). Some keyboards use only the type that needs to be soldered or unsoldered (Figure 8-B); no cutting of the solder pads needs to be done.
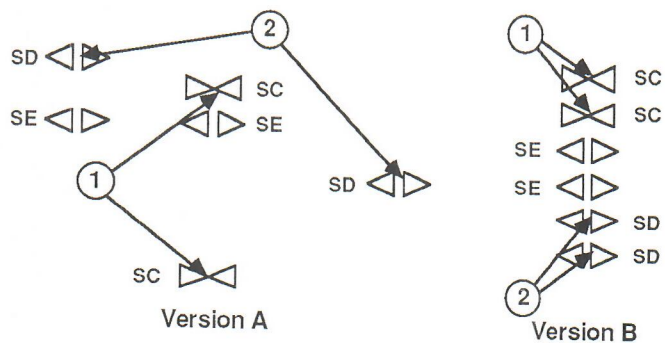

FIGURE 8A

Keyboard Figures

In Figures 8-A and 8-B, Version A represents the Mitsumi keyboard, and Version B represents the TCI keyboard. Refer to the appropriate figure and labeled version when performing the procedures.
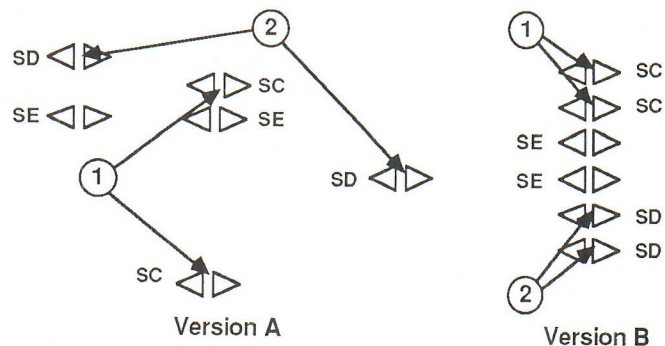

FIGURE 8B

Materials Required

Keyboard with built-in keypad to be modified
Exacto knife
Soldering materials
Digital ohmmeter

CAUTION: *When cutting the two jumper pads, be extremely careful so that no other traces will be cut.*

Instructions

1. Turn the keyboard so that the trace side is up and the cable connector is at the top. The jumper pads are located under the cable connector on the circuit board.

2. Locate the two jumper pads marked SC (Figure 8, #1). Using the exacto knife, separate the two jumper pads, one pair at a time, by cutting the junction at the location indicated in Figure 9, #1.
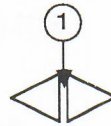
FIGURE 9

If you are using the keyboard that uses the solder pads shown in Figure 10, desolder the jumper pads and continue with the procedure.

FIGURE 10

3. Use the ohmmeter to verify that the two jumper pads marked SC are not touching.

4. Locate the two jumper pads marked SD (Figure 8, #2). Apply a little bit of solder to the iron. Then, with the tip touching the jumper pads, one pair of pads at a time, apply the new solder to the location indicated in Figure 10, #1.

5. Use the ohmmeter to verify that both SD jumper pads are now connected.

❏ ROM AND VIDEO GRAPHICS CONTROLLER UPGRADES

Introduction

There are two IC upgrades available for the Apple IIGS:

- ROM
- Video Graphics Controller or VGC

ROM Upgrade

The ROM upgrade corrects some minor bugs and provides some enhancements for future software releases. The old ROM is P/N 342-0077-A; the new replacement ROM is P/N 342-0077-B.

Materials Required

ESD equipment
IC extractor
ROM P/N 342-0077-B

Procedure

1. Set up the ESD equipment (refer to *You Oughta Know*).

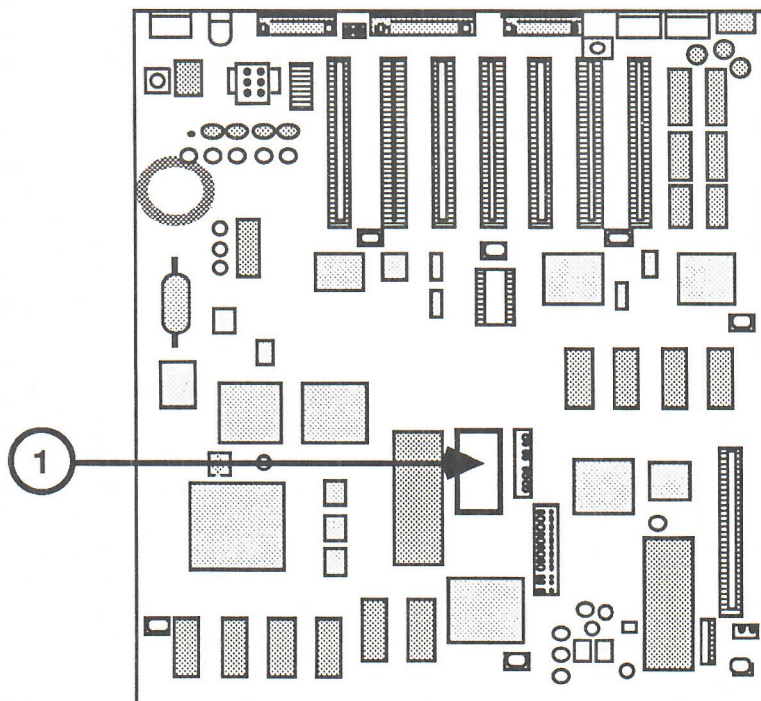2. <u>Remove the top cover</u>.

FIGURE 11

3. Locate the ROM at location H10 (Figure 11, #1) and verify that it is the old ROM (P/N 342-0077-A).

4. Using an IC extractor, remove the old ROM installed at location H10 (Figure 11, #1).

5. Install the new ROM in the same location, H10 (Figure 11, #1). There is a notch at one end of the ROM. This notch should face the **front** of the machine on installation.

6. Run the diagnostics to verify that the machine is functioning correctly.

VGC Upgrade

The VGC upgrade corrects screens that may be cosmetically flawed in various modes of display. The VGC is located at H5 on the Apple IIGS logic board.

Defective VGCs

The following is a list of the VGCs that display this problem and should be replaced.

Vendor	Number
AMI	344S0046-1
AMI	344S0046-A

Good VGCs

The following VGC versions, if already installed, do **not** need to be replaced.

Vendor	Number
AMI	344S0046-2
AMI	344S0046-B

Replacement VGCs

The following are versions of the VGC that should be installed to correct the display problem. Any of the following versions can be used.

Vendor	Number
AMI	344S0046-3
IMP	344S0046
IMP	344S0056

Materials Required

ESD equipment
VGC IC extraction tool (special tool)
VGC, as indicated above

Procedure

1. Set up the ESD equipment (refer to *You Oughta Know*).

2. Remove the top cover.

3. Remove the power supply.

4. Locate the VGC at location H5 (Figure 12, #1) and verify that it needs to be replaced by comparing the vendor and number on the IC with the list above.

5. Remove the logic board.

WARNING: *To prevent physical damage to the VGC socket and the logic board, the logic board must be removed before attempting to use the special VGC extraction tool.*
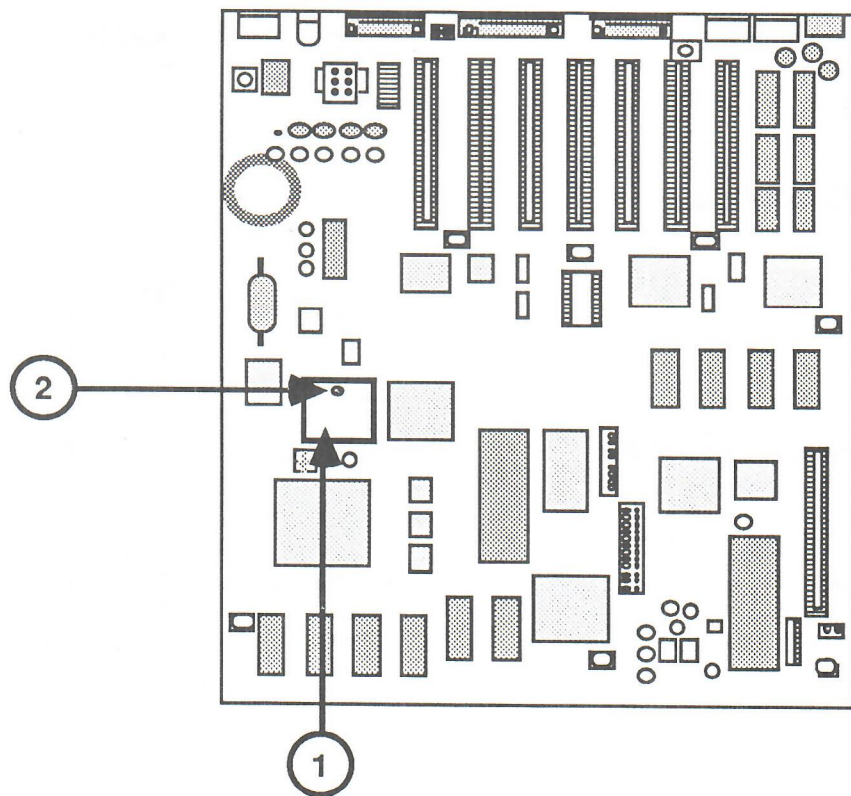

FIGURE 12

6. Remove the old VGC installed at location H5 (Figure 12, #1) using the VGC extraction tool.

7. Using the VGC extraction tool, install the new VGC in the same location, H5 (Figure 12, #1). The dot at pin 1 on the IC should face the rear of the machine (Figure 12, #2).

8. Run the diagnostics to verify that the machine is functioning correctly.

É Apple Technical Procedures

Apple IIGS

Section 6 – Illustrated Parts List

❑ CONTENTS

The figures and lists in this section include all piece parts that can be purchased separately from Apple for the Apple IIGS, along with their part numbers. These are the only parts available from Apple. Refer to your *Apple Service Programs Manual* for prices.
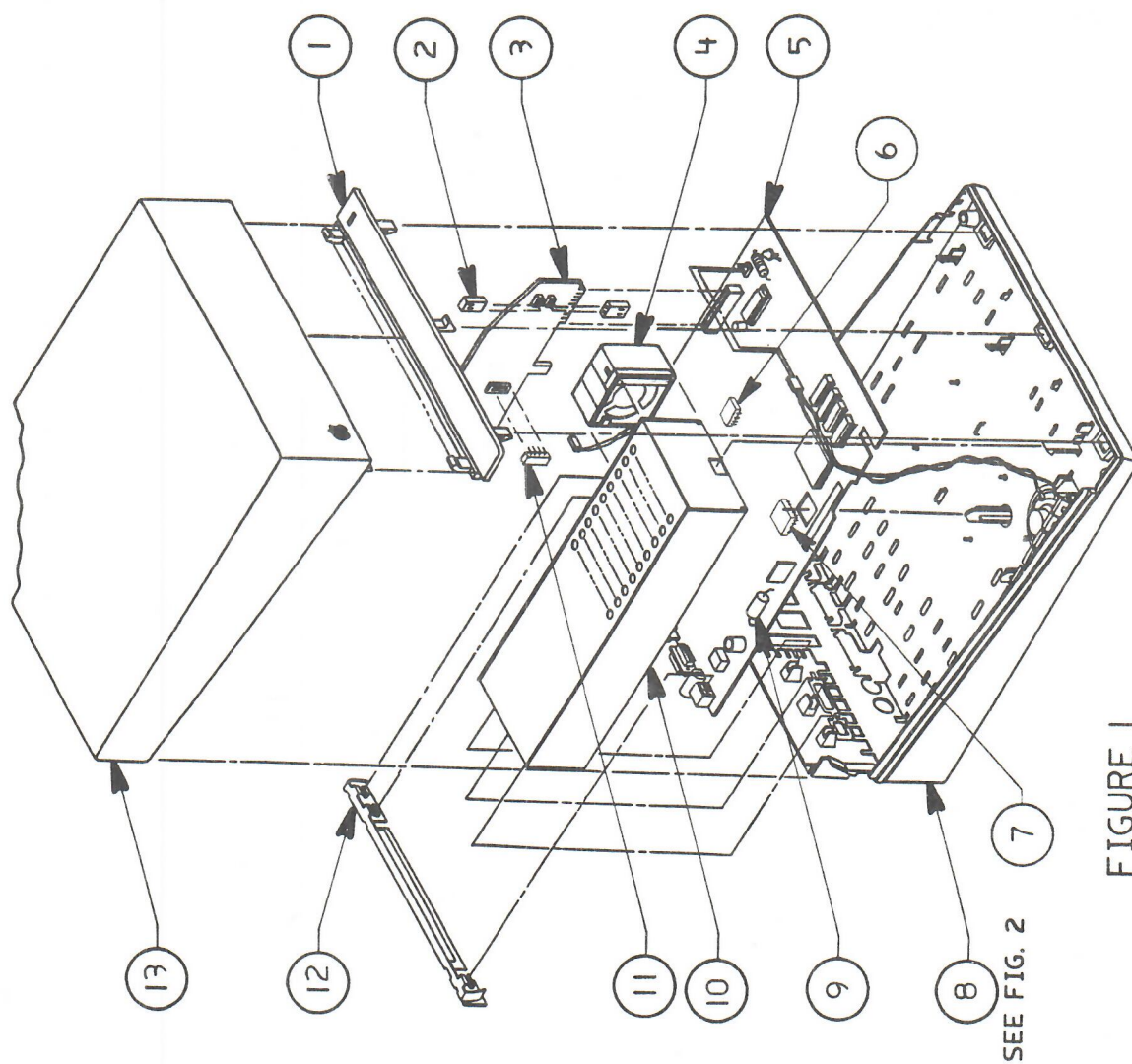
FIGURE 1

SEE FIG. 2

❏ APPLE IIGS – MAIN ASSEMBLY (Figure 1)

Item	Part No.	Description
1	607-5006	Case Hinge
2	517-1230	RAM Expansion Card Jumper
3	661-0336	Memory Expansion Card
4	607-5007	Fan
5	661-0334	Main Logic Board
6	342-0077	IC, 1M ROM
7	344S0056	IC, VGC
8	607-5005	Base
9	742-0007	Lithium Battery
10	661-0335	Power Supply
11	334-0021	RAM, 256K
12	805-0169	EMI Fence
13	607-5004	Top Cover
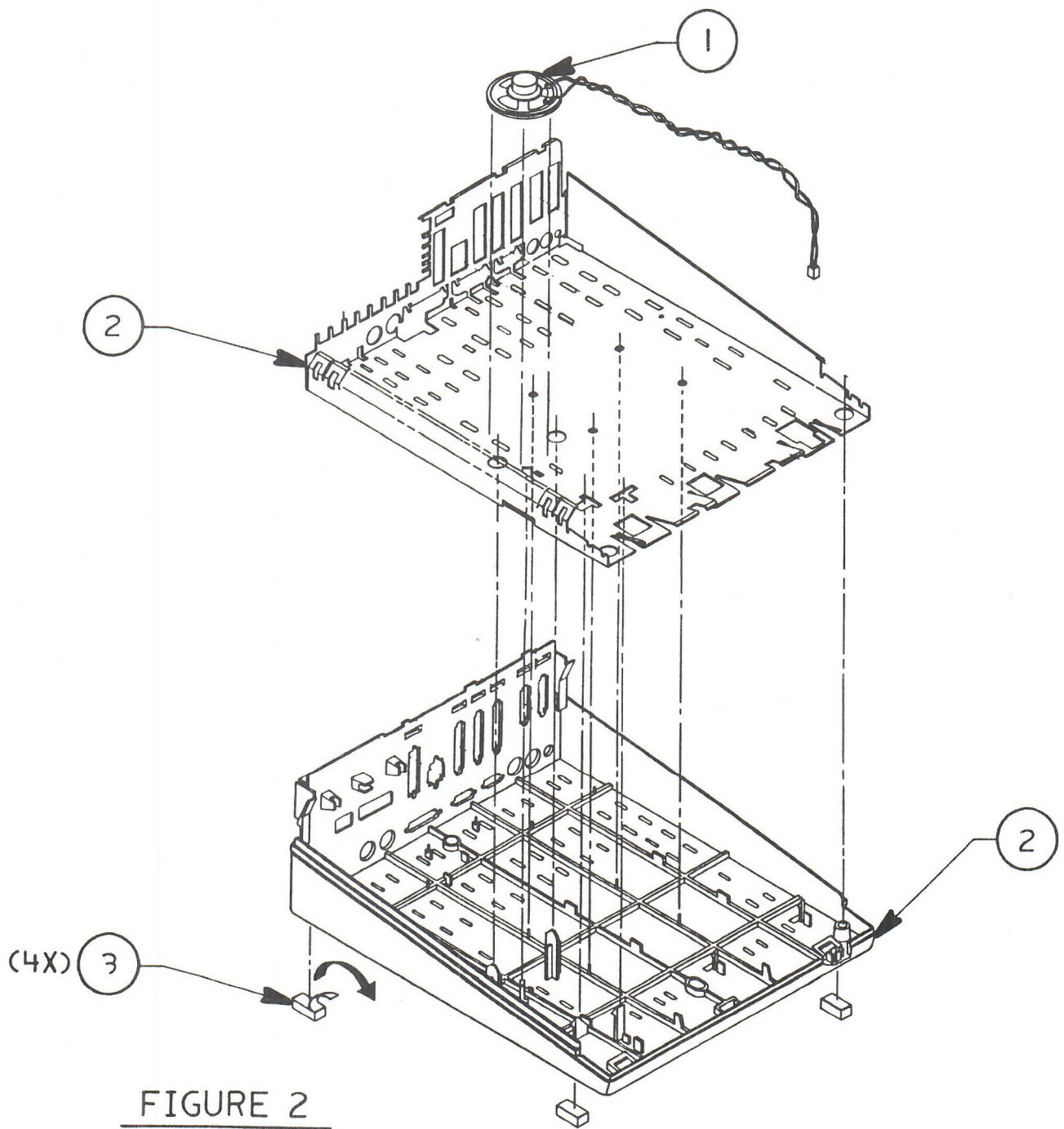
FIGURE 2

❏ APPLE IIGS – BASE ASSEMBLY (Figure 2)

Item	Part No.	Description
1	607-5174	Speaker
2	607-5005	Apple IIGS Base
3	865-0024	Apple IIGS Foot

TOP VIEW

FRONT VIEW
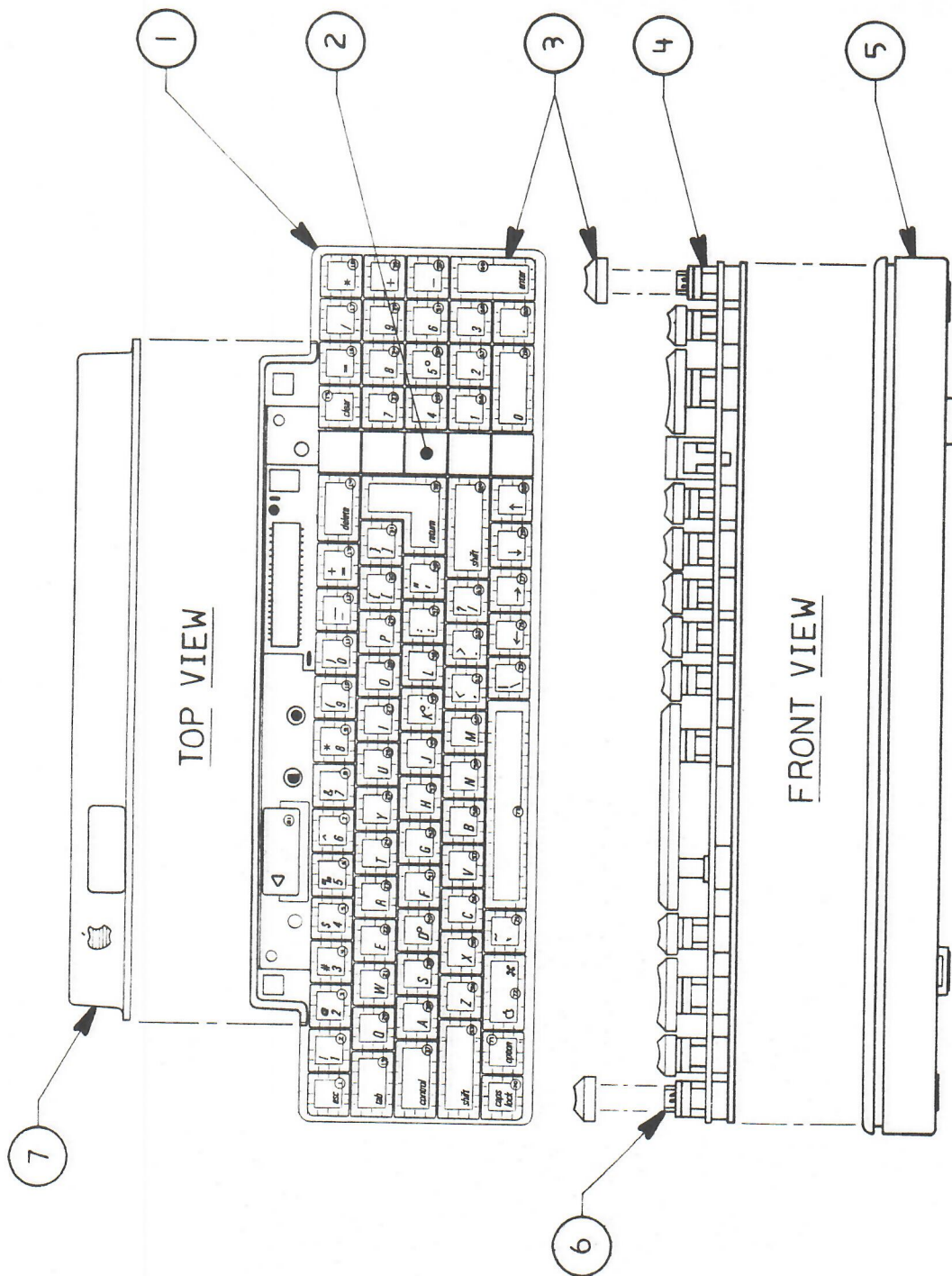
FIGURE 3

❏ APPLE IIGS – CABLES (Figure 5)

Item	Part No.	Description
1	590-0361	ADB Keyboard Cable
2	590-0109	ADB Cable
3	590-0550	Peripheral Adapter Cable, Apple IIGS
4	590-0380	AC Power Cable, Platinum
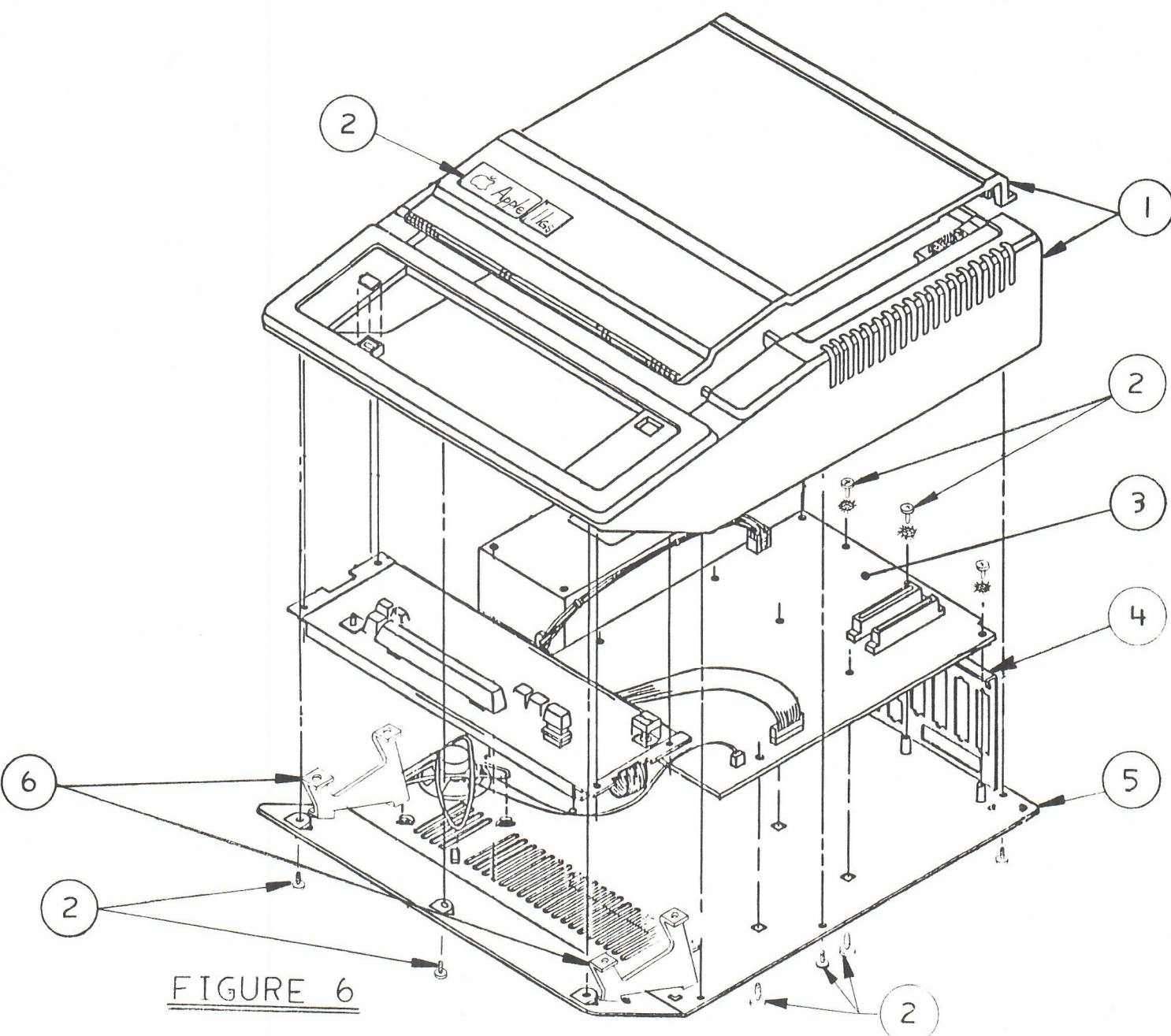
FIGURE 6

❑ APPLE IIGS – UPGRADE (Figure 6)

Item	Part No.	Description
1	076-0127	Apple IIe Case and Lid, Beige
2	607-5183	Assembly Hardware Package
3	661-0334	Apple IIGS Main Logic Board
4	875-0063	Shielding Strip
5	607-5012	Bottom Pan
6	805-0168	Bracket, Apple IIGS Upgrade Keyboard